



Munitions Directorate

NEXT GENERATION AIR FORCE MUNITIONS TECHNOLOGY



Mr. Oscar Soler

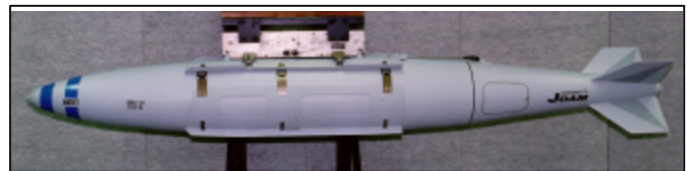
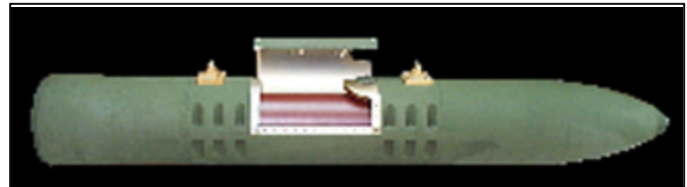
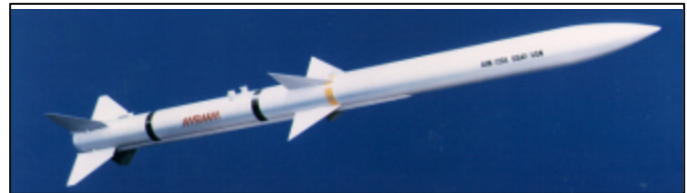
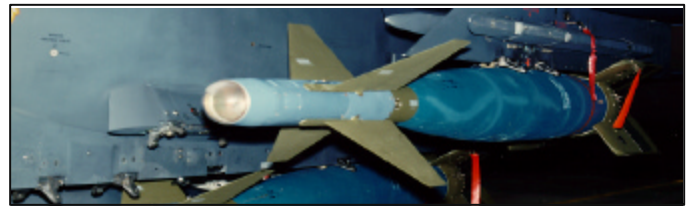
Deputy Director

Assessment & Demonstrations Division

Munitions Directorate

Air Force Research Laboratory

MISSION:
DEVELOP, INTEGRATE, AND
TRANSITION SCIENCE AND
TECHNOLOGY FOR AIR-
LAUNCHED MUNITIONS FOR
DEFEATING GROUND FIXED,
MOBILE/RELOCATABLE, AIR,
AND SPACE TARGETS TO
ASSURE THE PREEMINENCE OF
U.S. AIR AND SPACE FORCES.

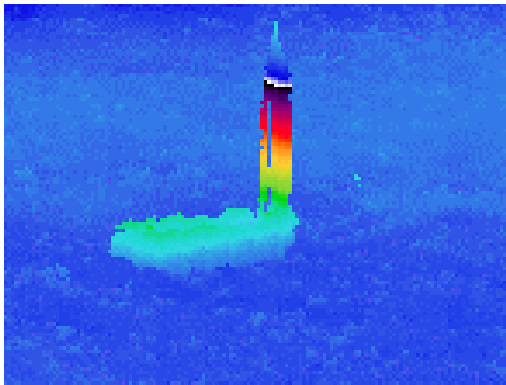




Munitions Directorate Focus Areas



**Precision Engagement
in Adverse Weather**



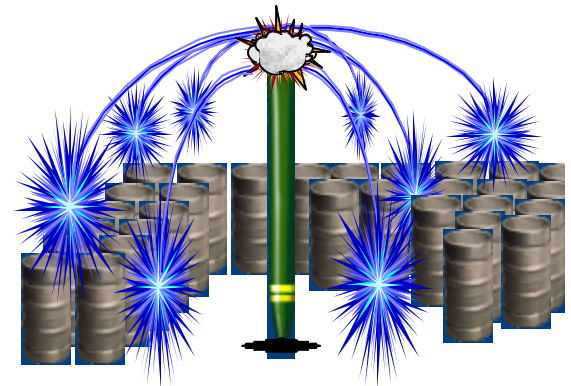
**Autonomous / Smart
Sensor Web Munitions**



Hard Target Defeat



**Focused Lethality &
Higher Energy Materials**



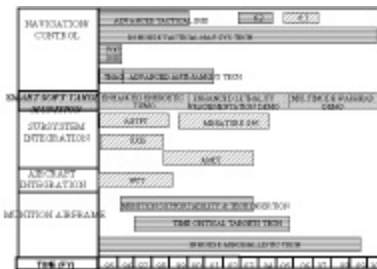
**Alternatives to Blast
Fragmentation**



Munitions Directorate Planning Process



**INTEGRATED
TECHNOLOGY
PROGRAM**



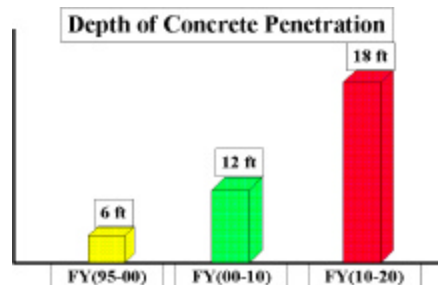
**CONCEPTS
FROM AIR
ARMAMENT
SUMMIT**

**INTEGRATING
CONCEPTS**

**TECHNOLOGY
ASSESSMENTS
QFD**

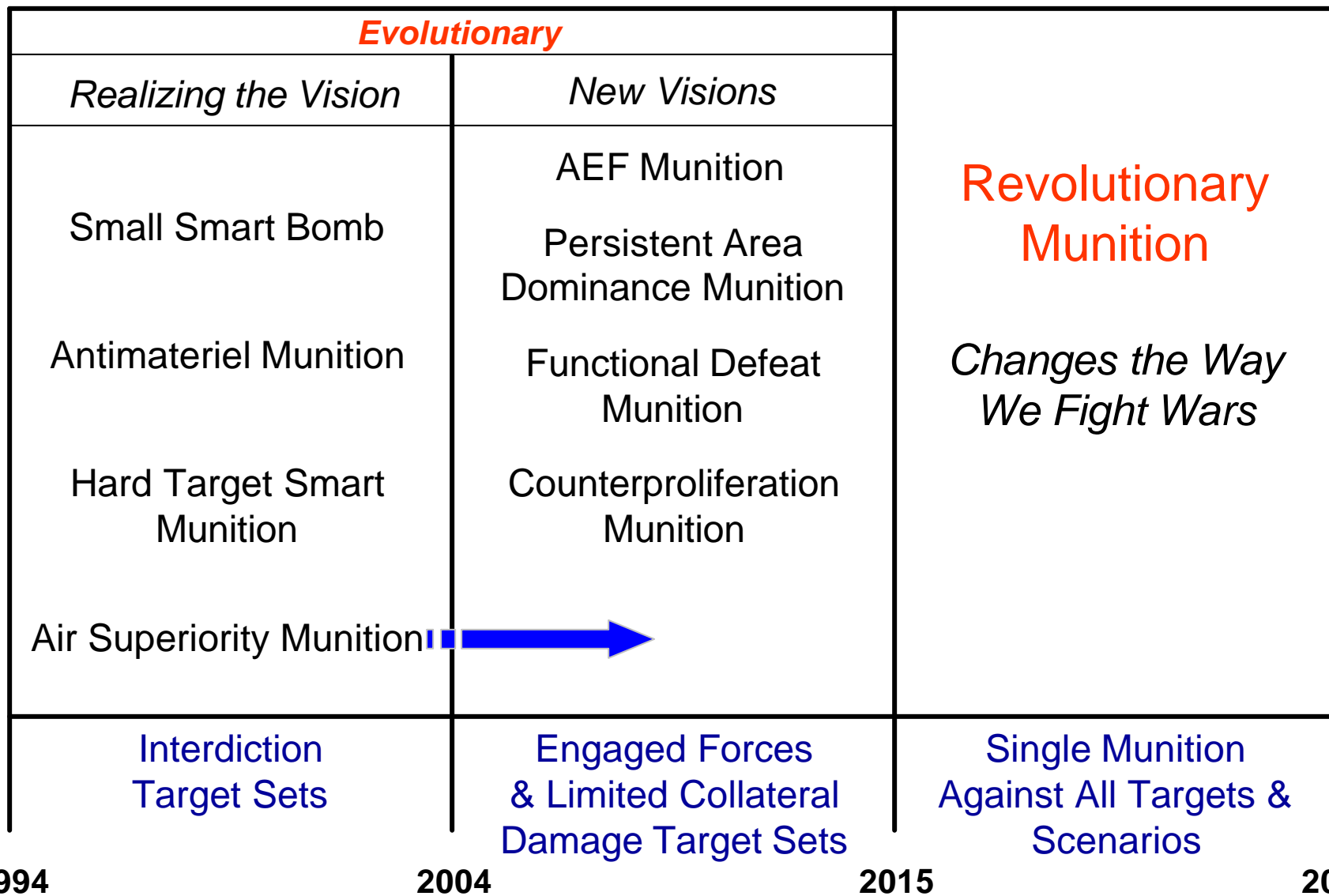
**Weapon
Attributes
vs.
Technologies**

**TIME PHASED
TECHNOLOGY
GOALS**





AFRL/MN Integrating Concepts *Evolution / Revolution*



Small Smart Bomb

Realizing the Vision



**Direct Attack Miniature
INS/GPS Munition**

Footprint Expansion

**Precision Guided
Direct Attack Munition**

Near Term

Accomplishments

- 5 Flight Tests
- Differential INS/GPS Guidance
 - 4.5M Precision (95%) (No TLE)
 - Reduce Collateral Damage
- Impact Condition Control
 - Accuracy
 - Obliquity
 - Angle-of-attack
 - Velocity
- 6 Feet Concrete Penetration

Current Attributes

- 35 NM Weapon Footprint
 - Launch Flexibility
 - Single Release Point
- Robust Fin Fold Design
 - F-22 Envelope
 - High Reliability

- Autonomous Mobile Attack Capability
- Multiple Kills per Pass
- Reduced Airlift Requirements
- 3 Meter (95%) Accuracy
- Cockpit Selectable Fuzing
- Real Time BDI
- High Density Load-out
- UCAV / CAV Compatibility

**Double the Kills per Sortie for 85% of
Fixed/Stationary Targets and Lethal
Effectiveness Against Mobile/Relocatable Targets**



Small Smart Bomb Technologies



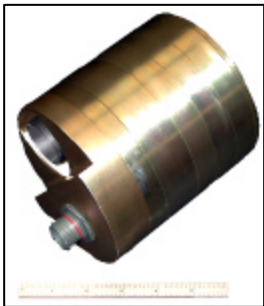
**JDAM CAS,
FOLDING FINS**



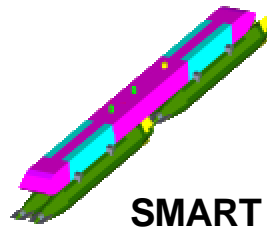
**MULTI EVENT HARD
TARGET FUZE
(MEHTF)**



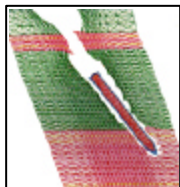
**COMPACT RANGE
EXTENSION WINGKIT**



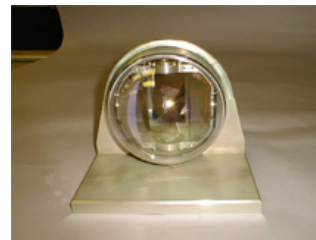
**MINIATURIZED
ANTI JAM GPS/INS**



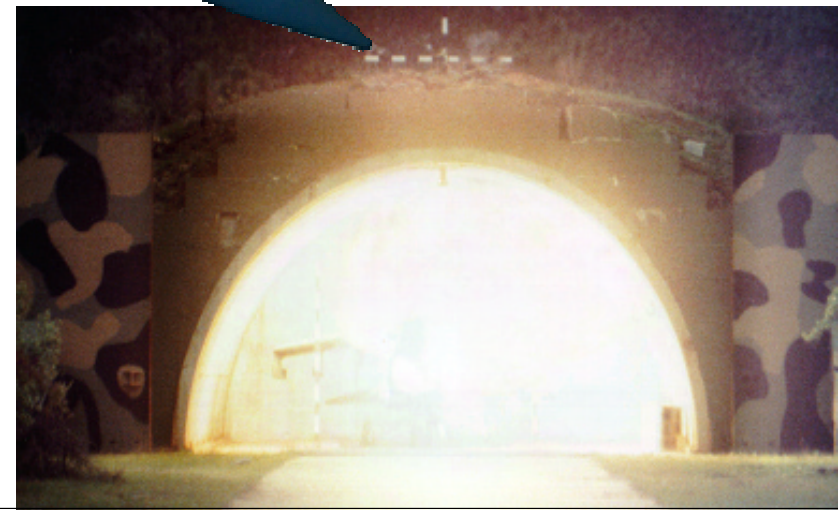
**SMART MULTI
EJECTOR RACK**



**HIGH STRENGTH
STEEL PENETRATOR
WARHEAD**



LADAR SEEKER



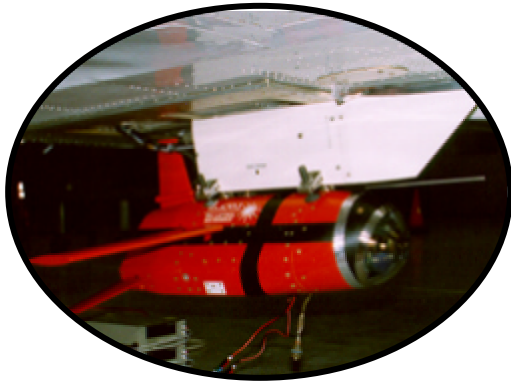


SSB Bunker Test

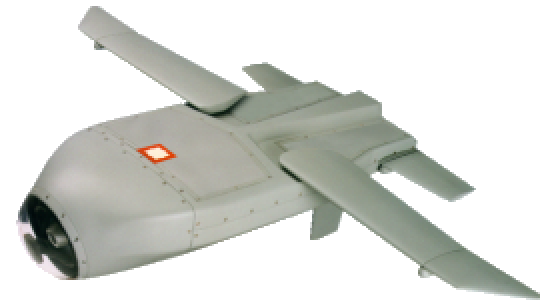


Antimateriel Munition

Realizing the Vision



Glider LOCAAS



Powered LOCAAS

Accomplishments

- Demonstrated Terminal Accuracy
 - Free Flight Test
- Demonstrated Low False Alarm Rate
 - Captive Flight Test
- Demonstrated Multimode Warhead
 - Ground Test against Broad Target Set
- Demonstrated Octol-Equivalent Cast Cure Explosive
 - AFX-221

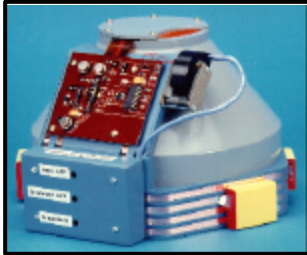
Near Term Attributes

- Increase Sortie Effectiveness
- Reduced Airlift Requirements
- Increase Standoff Range
- Search & Destroy Mobile Targets
- 2 Meter Precision (95%)
- Low False Target Attack Rate
- Reduce Mission Planning
- Time Critical Target Capability
- High Density Carriage
- UCAV / CAV Compatibility
- Affordable & Reliable

Interdict & Defeat a Broad Spectrum of Ground Mobile Targets including TELs



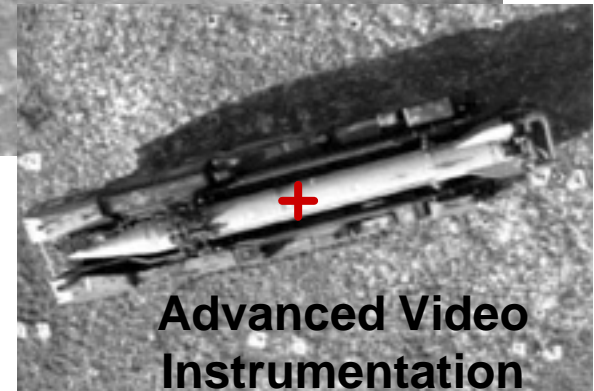
LOCAAS Enabling Technologies



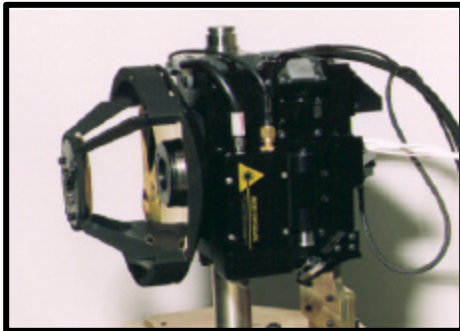
**Multimode
Warhead**



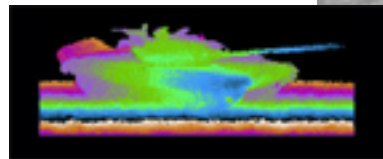
TJ-50 Engine



**Advanced Video
Instrumentation**



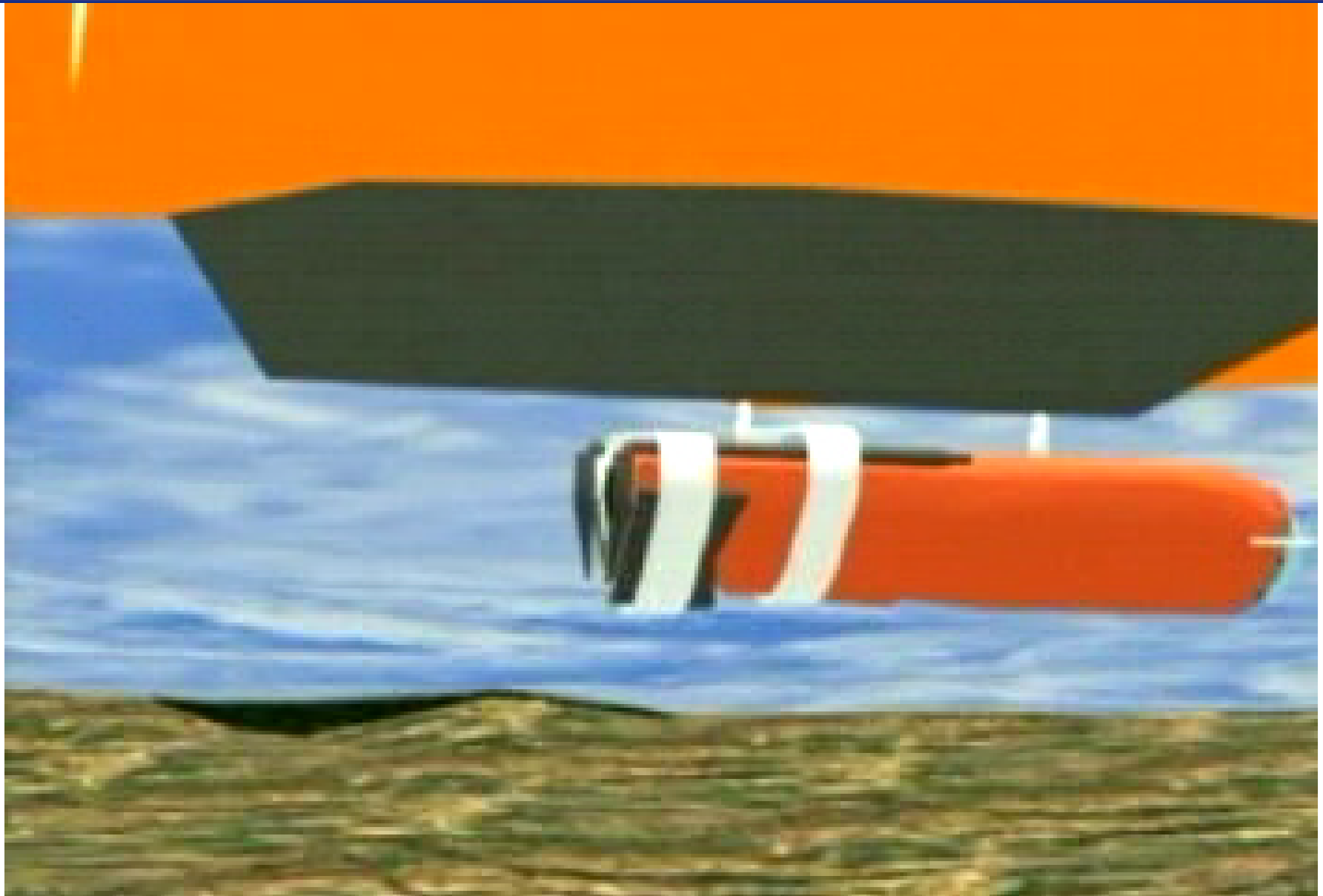
LADAR Seeker



ATR Algorithms



LOCAAS Simulated Test Flight

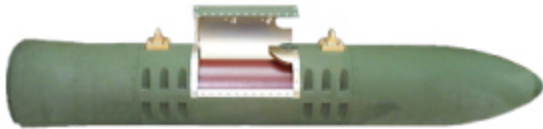


Hard Target Smart Munition

Realizing the Vision



BLU-116/B



WHU-42



High Speed Precision Penetrator

Near Term Attributes

Transitioned to Acquisition

Accomplishments

- JAST 1000 – WHU-42
- Adv Unitary Penetrator – BLU-116 / B
- GBU – 28 – BLU 113
- Hard Target Smart Fuze – FMU-157
- AFX - 757, MNX-821, MNX-650

- Deep Penetration (4x-5x Blu – 109)
 - 4500 FPS Munition Survival & Fuze Function
- 3 Meter (95%) Precision
- Antijam GPS / INS
- Real Time BDI
- Adverse Weather

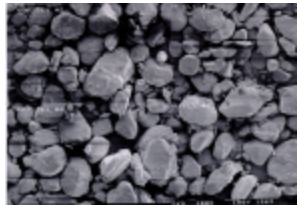
**Put Enemy's Deeply Buried
Targets at Risk**



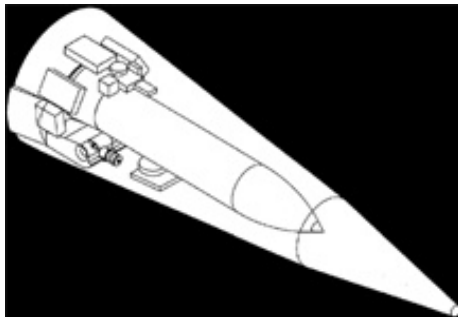
Hard Target Smart Munition Technologies



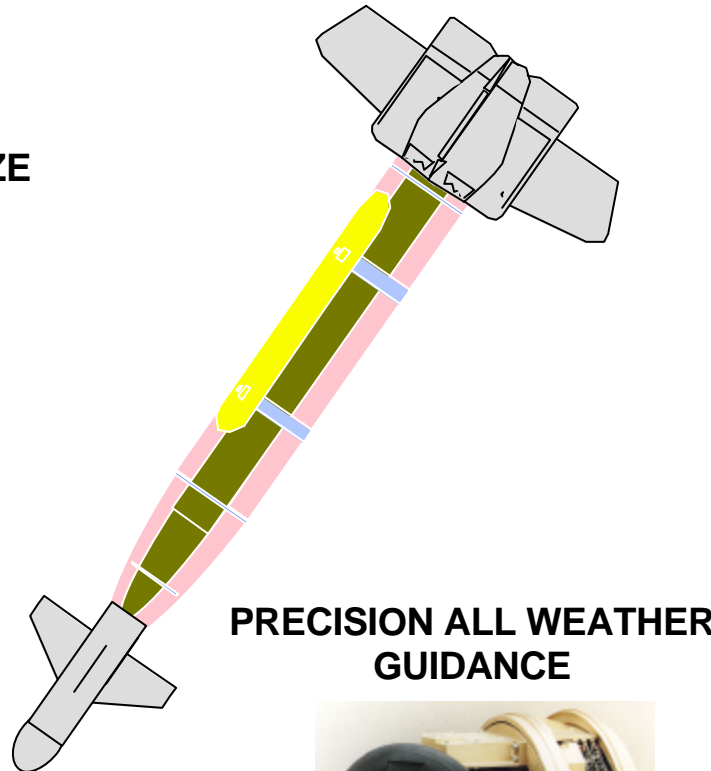
**HIGH SPEED
PENETRATING FUZE**



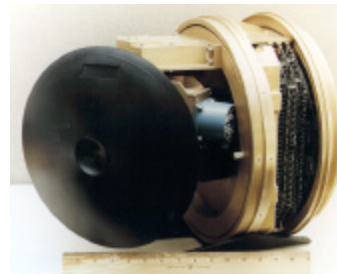
**INSENSITIVE EXPLOSIVE
FOR HIGH SPEED IMPACT**



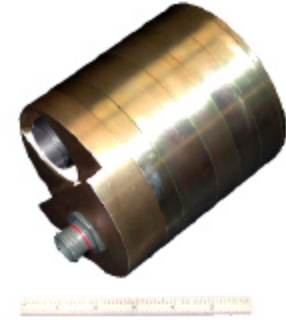
**PLATFORM
INTEGRATION**



**PRECISION ALL WEATHER
GUIDANCE**



**MINIATURIZED
GPS/INS**



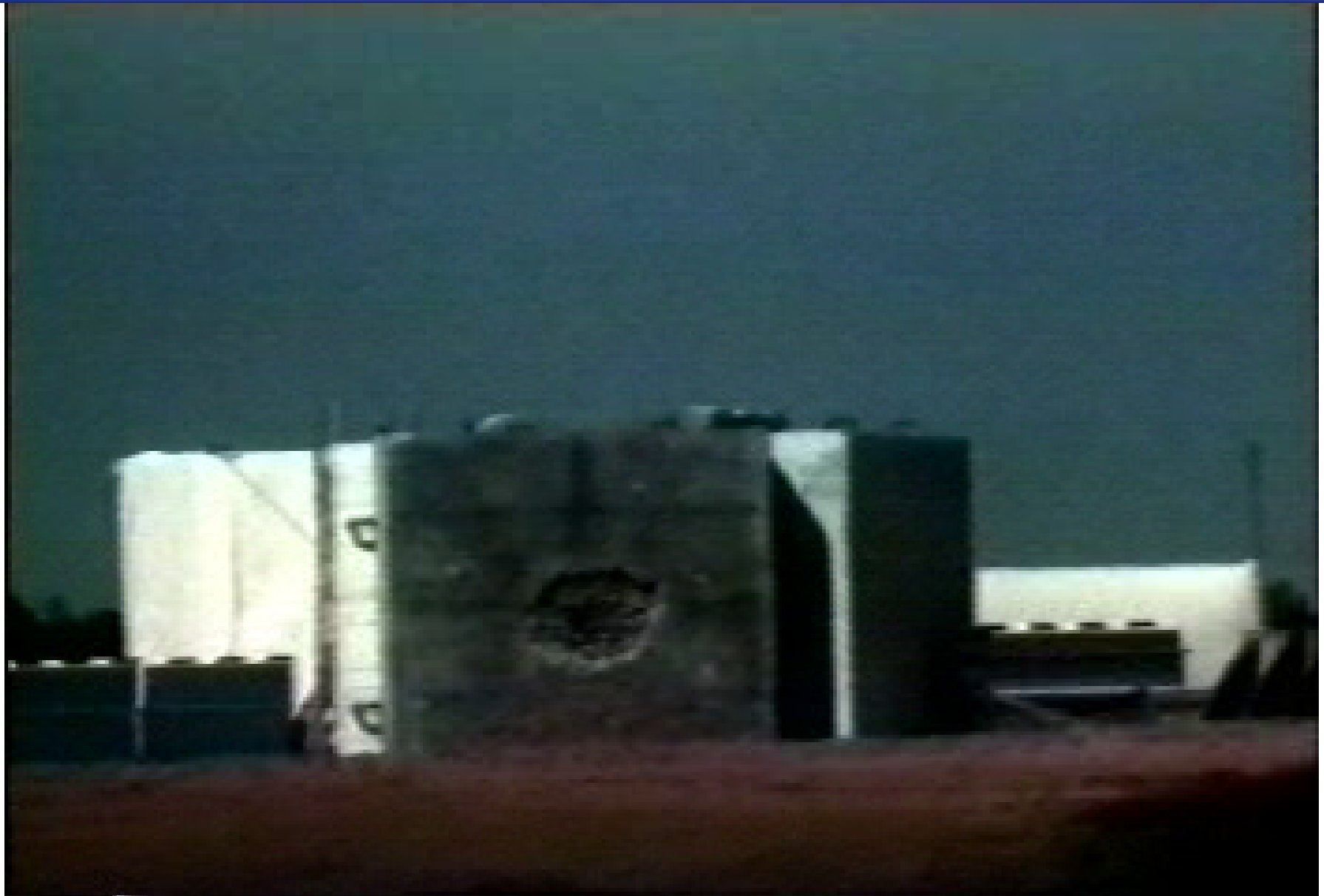
**HIGH STRENGTH
STEEL PENETRATOR
WARHEAD**



HIGH VELOCITY IMPACT



AUP Warhead Sled Test





BDA Test



BDA

Date: 12/06/00

Mission #3965

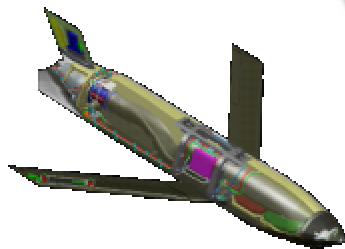
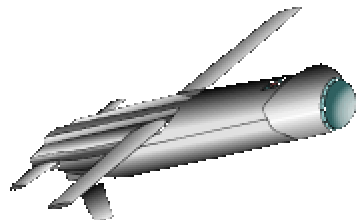
Project # AGZE0013

STEREO

SP

AEF Munition

Vision



- Low Cost Mini Cruise Missile
- Extended Range Standoff Munition
- Hypersonic Standoff Munitions

Mid Term Attributes

Near Term

(Basic Research and
Enabling Technology
Development Leading to
Mid & Far Term Goals)

- 100-2000 NM Standoff
- Reduced Platform Attrition
- Warhead Options
 - Defeat Multiple Target Elements
 - Decreased Warhead Size
 - Increase Penetration
 - Minimal Collateral Damage
 - Non-lethal
- Munition Borne BDI
- Smart Sensor Web Compatibility
- Wooden Round, Built on Demand

Far Term

See
Revolutionary
Munition
Vision

Rapidly Degrade Enemy
Warfighting Capability without
Manned Over-flight



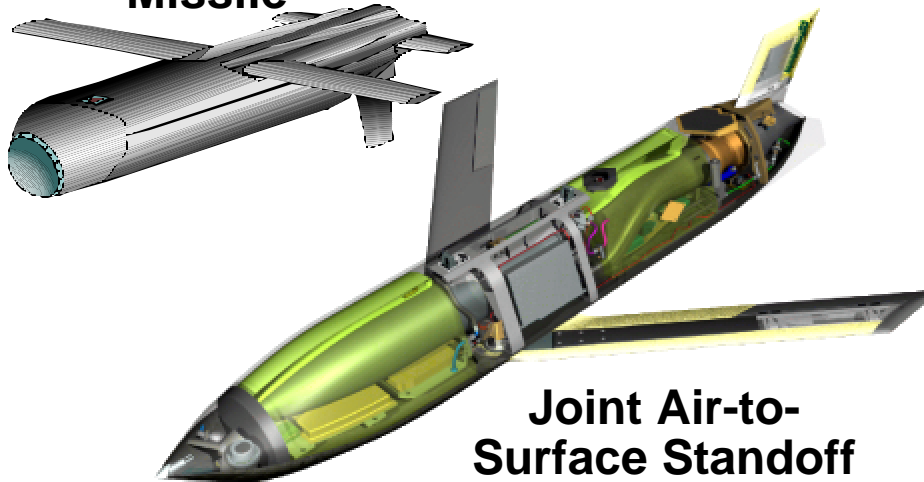
AEF Enabling Technologies



Unitary Directional Warhead

- High Energy Explosive
- Alternate Smart Submunition Payloads

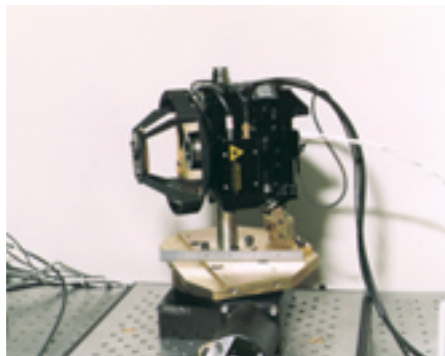
Low Cost Miniature Cruise Missile



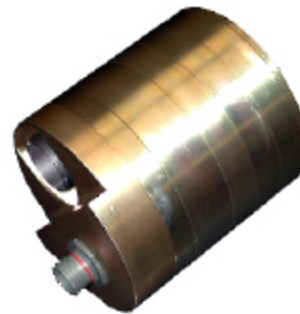
Joint Air-to-Surface Standoff Missile P³I



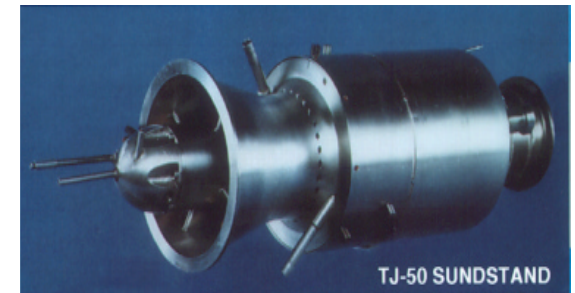
Data Link to Smart Sensor Web



FPA LADAR & Multimode Seeker



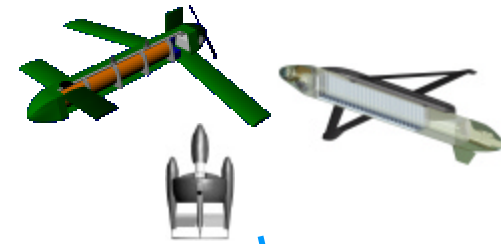
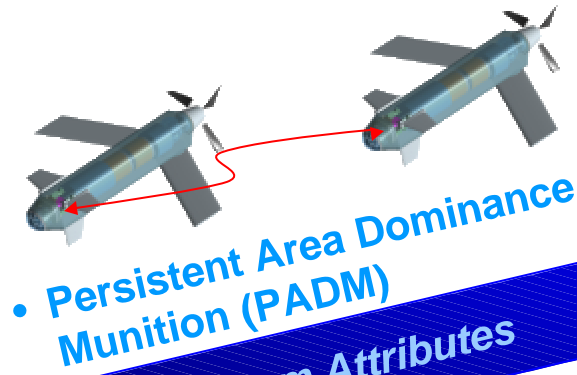
Miniature AJ GPS Receiver



**High Efficiency Turbofan Engine
High Energy Density Fuels**

Persistent Area Dominance

Vision



• Total Dominance Layered System (TDLS)

• Persistent Area Dominance Munition (PADM)

Mid Term Attributes

Far Term

Near Term

(Basic Research and Enabling Technology Development Leading to Mid & Far Term Goals)

- Deny Enemy Operations Over Large Areas with Persistence
 - Loitering PADM Constellation
- Effective in Multiple Mission Areas (CAS, AI, MOUT, TCT, Rapid Halt etc.)
- Real Time BDA
 - Weapon Data Link to GIG
 - LADAR/Video Imagery
- Improved Target ID
 - Non-Cooperative Target ID
 - Post Launch MIL Decision
- Multi Kills/Weapon
- High A/C Load Out
- Reduced Collateral Damage W/Hs
- Countermeasure Robustness

- Deny Enemy Operations in All Environments
 - Dominate Vertical Dimension
- Effective against Fixed and Mobile Targets
- Compact Focused Lethality W/Hs
 - Variable Yield
 - Directional
 - Advanced Energetics
- Real Time BDA
 - Autonomous BDA & Re-Strike
 - Layered Weapons/Sensors Array
- Improved Target ID
 - Identify Friend or Foe
- Countermeasure Robustness

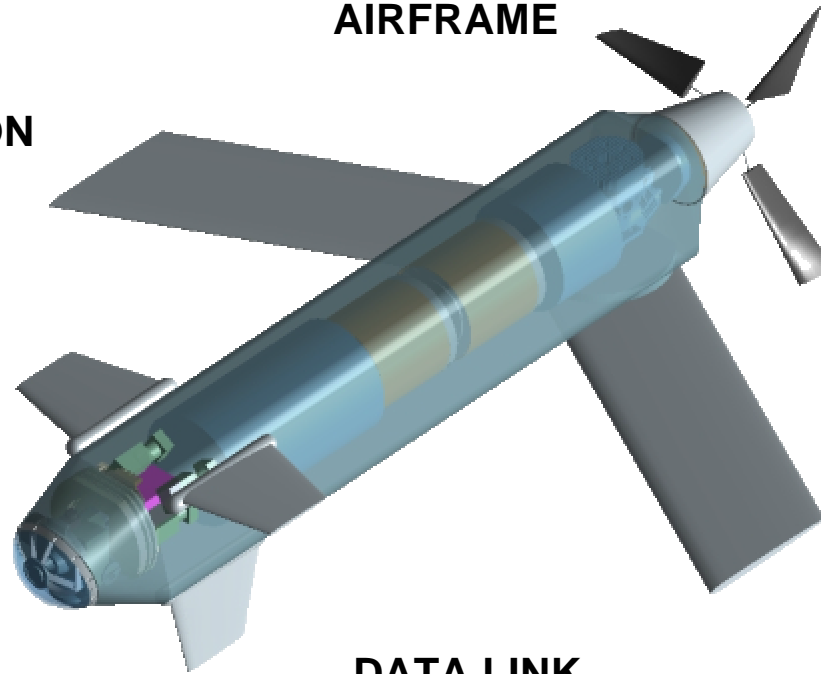
Defeat a Broad Spectrum of fixed and Engaged Ground Mobile Targets in High Clutter Environments (Urban Terrain)



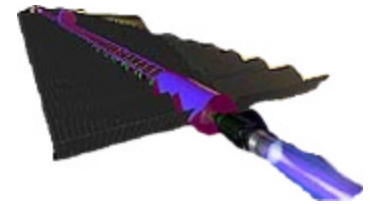
Persistent Area Dominance Munition Technologies



COMPACT
AIRFRAME



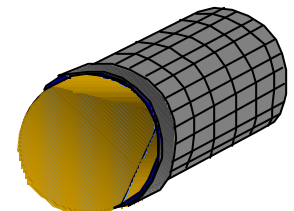
SPECIALIZED
PROPULSION



DATA LINK



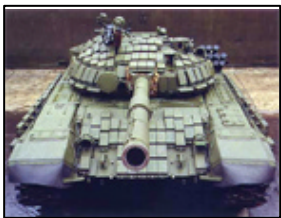
MASS FOCUS
WARHEAD(S)



NON-COOPERATIVE
TARGET IDENTIFICATION

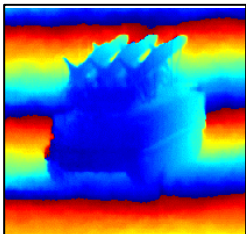


M1A1



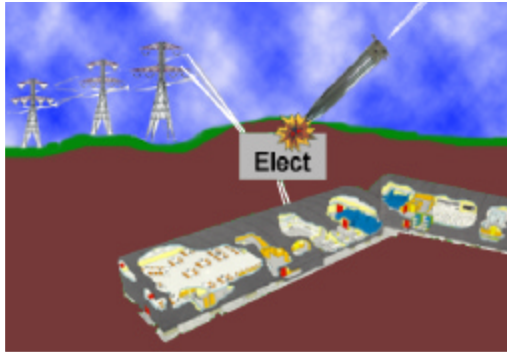
T-72

FLASH LADAR
SEEKER



Hard Target Functional Defeat Munition

Vision



Defeat Caves & Tunnels
(Facilities Denial & Critical Node Defeat)

Mid Term Attributes

Near Term

(Basic Research
and Enabling
Technology
Development
Leading to Mid &
Far Term Goals)

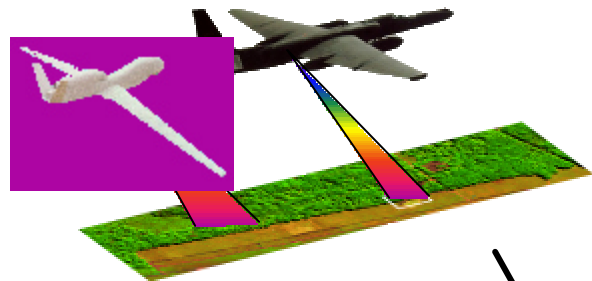
- Functionally Deny / Disrupt /
Degrade / Destroy
- Delay Repair
 - Survivable Influence Fuze
- Target Characterization
 - Detect Target Location
 - Determine Function
- Real Time BDI
 - Transmit Weapon Function
- Multiple Delivery Methods

See
**Revolutionary
Munition
Vision**

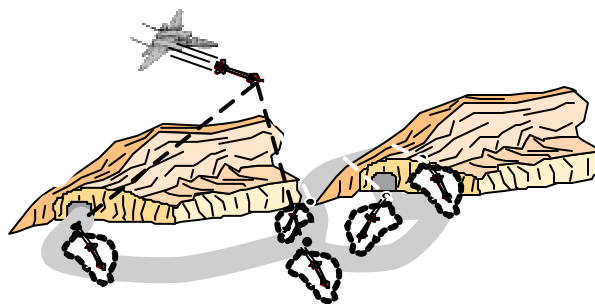
**Put All Enemy's Deeply
Buried Targets at Risk**



Hard Target Functional Defeat Technologies



Hyperspectral Imaging



Influence Fuze

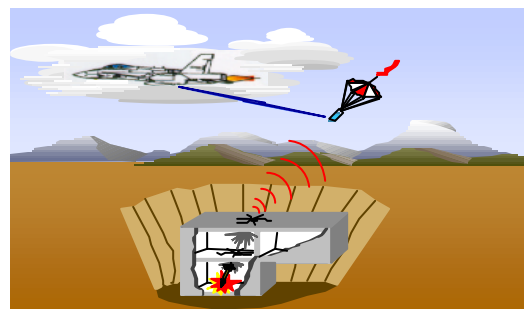


Triggered Isomer

Detect



Ground Penetrating Radar and Integrated Ground Sensors to Smart Sensor Web



Alternative Payloads

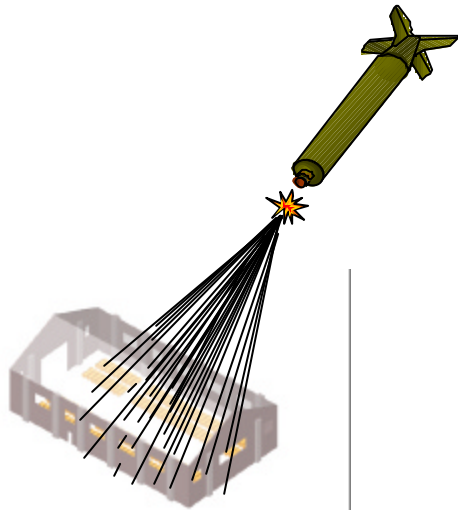
Defeat



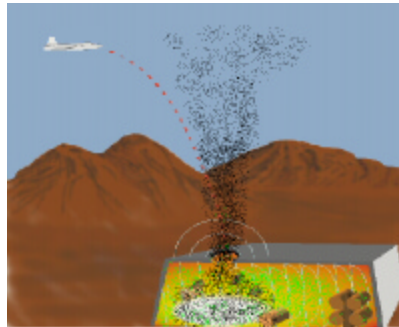
Micro Technology

Counterproliferation Munition

Vision



Soft Target Facility
Disruption



Defeat/Deny Access
Hardened Targets



Near Term

- 9 Meter CEP Accuracy
- Disrupt Soft Surface WMD Targets
- Minimize Collateral Effects
- Adverse Weather
- Engineering Predictive Models

Mid Term Attributes

- 3 Meter (95%) Precision
- Defeat Hardened WMD Targets
- Minimal Collateral Effects
- Real Time BDI
- Adverse Weather
- 1st Principle Predictive Models

Far Term

See
**Revolutionary
Munition
Vision**

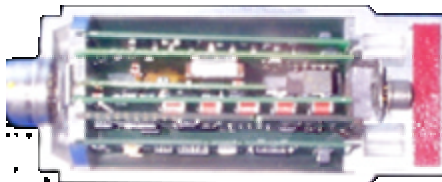
**Put All Enemy's WMD
Targets at Risk**



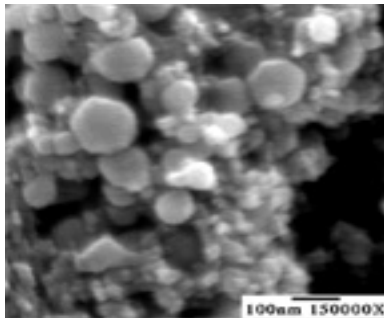
Counterproliferation Munition Technologies



Shredder Weapon

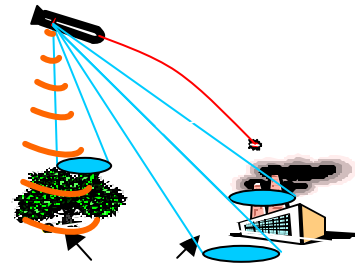


Multi-Event Fuzing

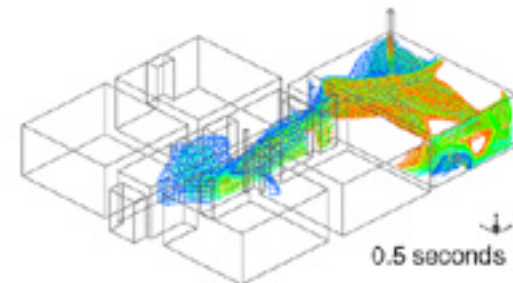
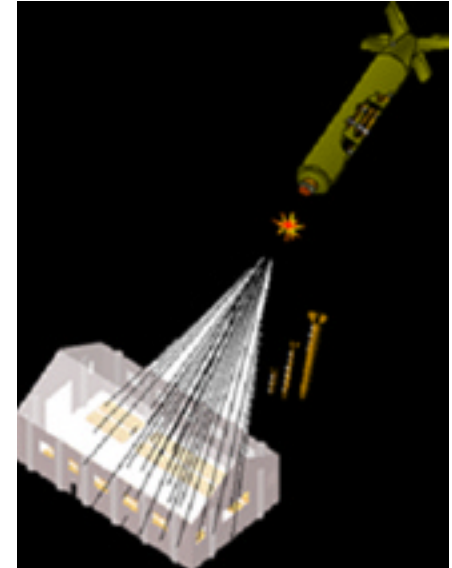


**Ballotechnic / Nano
Material Technology
Agent Defeat Energetics**

**Surface Target
Ordnance Package**



**Fuze Air-To-Surface
Technology (FAST)**



**Validation
Experiments for
High-Fidelity Models**



Agent Defeat Warhead Sled Test



072:18:43:16.534



Air Superiority Missile

Vision



Increase Missile
Agility

Increase Single
Shot Effectiveness
(Precision Interceptor)

Near Term

Mid Term Attributes

Far Term

DE

MN



(Basic Research
and Enabling
Technology
Development
leading to Mid &
Far Term Goals)

- Long & Short Range Application
- Defeat Small Targets (Size & RCS)
- Defeat Highly Maneuverable Targets
- Improve Target Discrimination / ID
- Improve Countermeasure Robustness
- Increase Off-Axis Intercept
- Increase Average Velocity
- Multi-Role Capability
 - Small Missile Defense
 - SEAD
- Reduce Missile Size
 - Propulsion & Warhead

See
Revolutionary
Munition
Vision

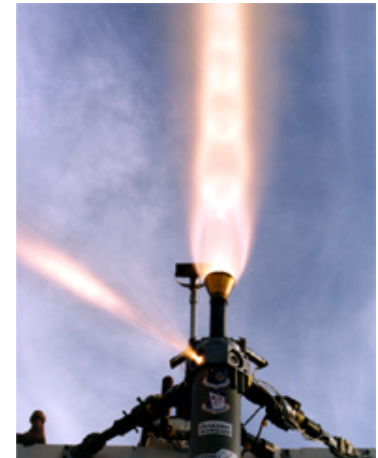
Dramatically Improve Weapon
Engagement Envelopes &
System Effectiveness



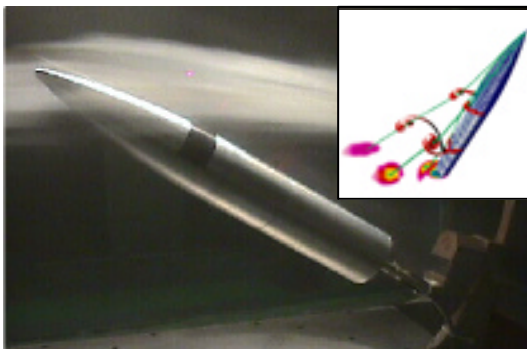
Air Superiority Missile Technologies



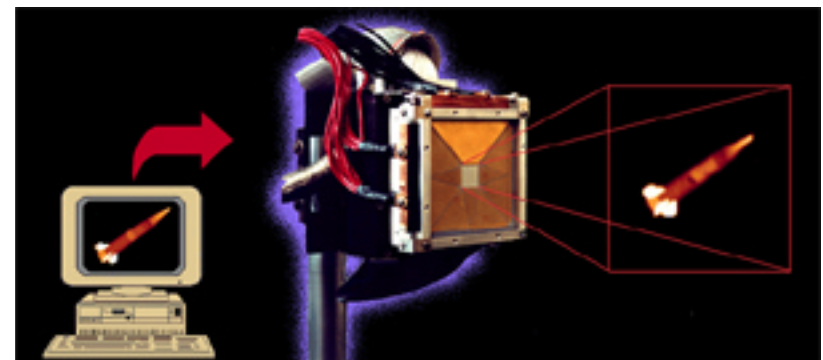
Mass Focus Warhead



Alternate Control



High Angle of Attack Autopilot



IR Imaging Fuze and Hardware-in-the-Loop Simulation



Reaction Jet Test





Air-to-Air Warhead Shot



Revolutionary Munition

Vision



Near Term

Revolutionary Ordnance Programs
Revolutionary Guidance Programs

Mid Term Attributes

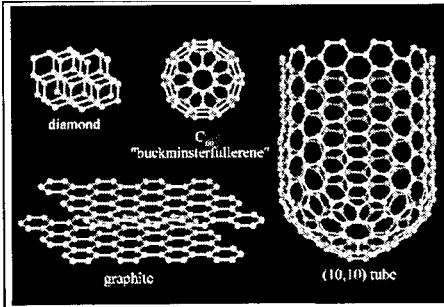
Far Term

- Omni-Role Munition
- Affordable & Reliable
- Extremely Long Range & Endurance
- High Agility (Air & Space)
- Immediate Reaction
- Total Situation Awareness
- Countermeasure Robust
- Tailorable Warhead Effects
- Multiple Effects Payload Options
- No Collateral Damage

**Single Munition Against
All Targets & Scenarios**

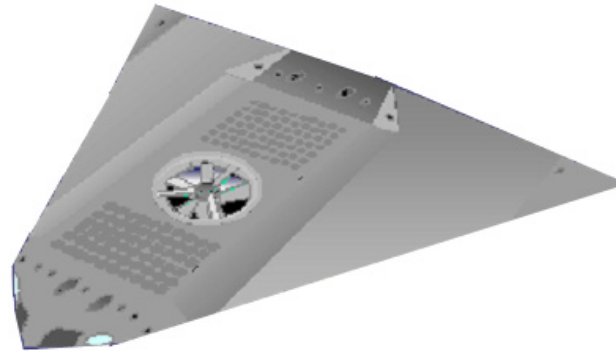


Revolutionary Munition Technologies



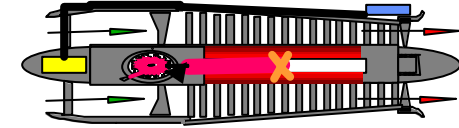
Nano Technologies

Conformal Antenna Radar



Stealthy, Compact Airframe

Positron Energy Conversion Turbojet / Rocket Propulsion

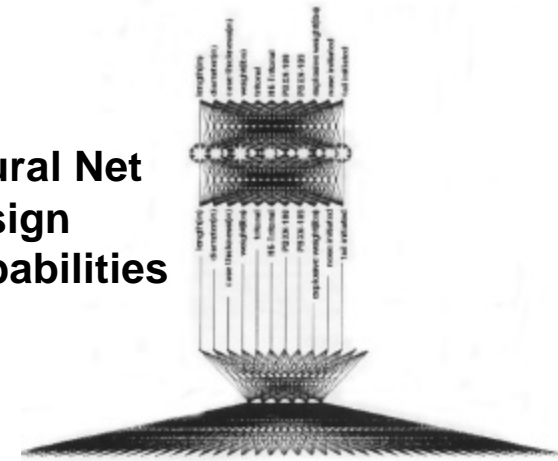


Microbots



0.2 m, R95 Accuracy

Neural Net Design Capabilities



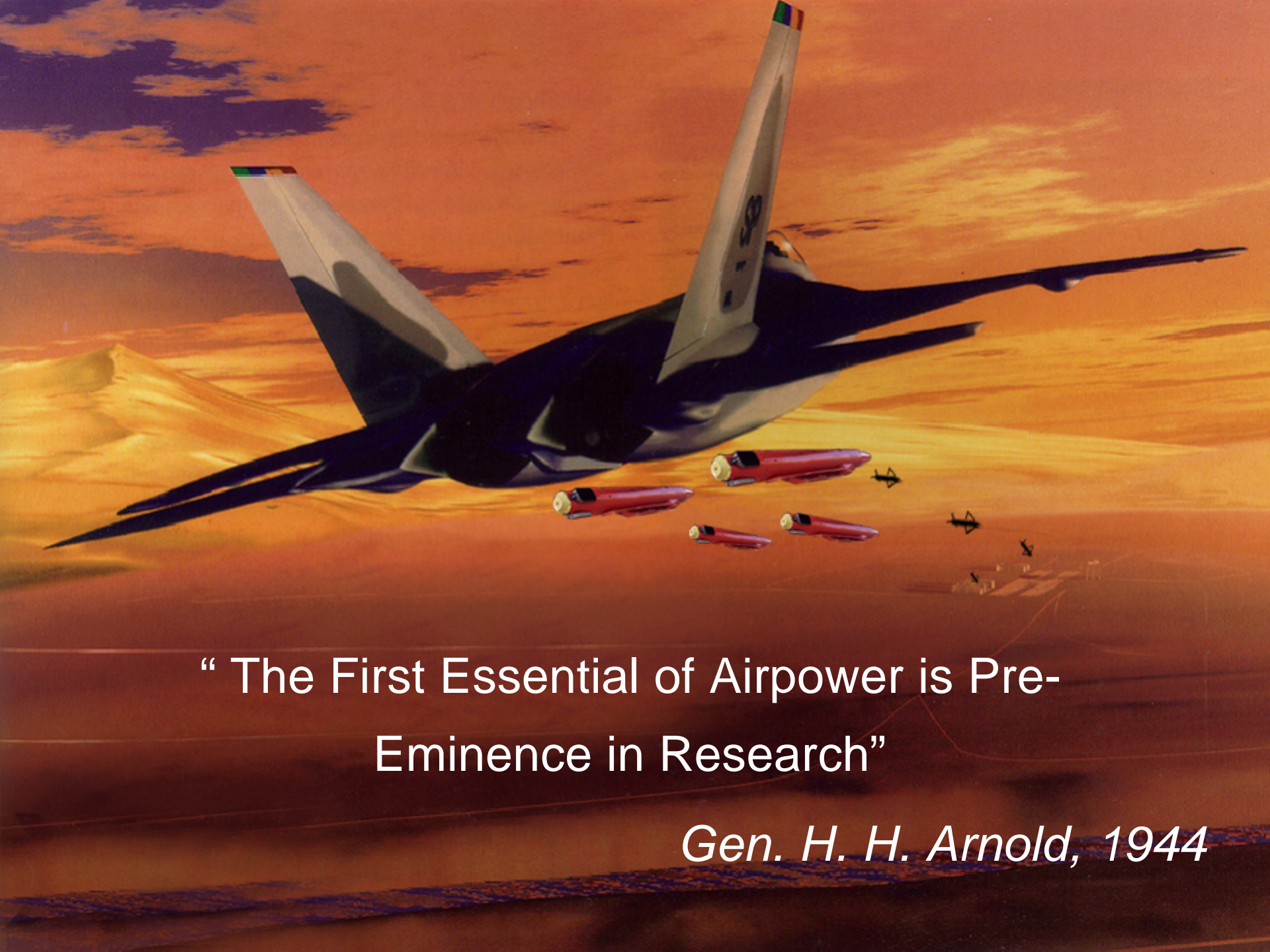


Summary



- **MN Vital to AF's Weapons Development**
- **Linked to Users, Product Centers & Academia**
- **Integrating Concepts Build the Vision for Our Technology Push**
- **Aggressive Business Planning to Balance Portfolio Goals**
- **Right Sizing for Building Tomorrow's Munition Technology Needs**





“ The First Essential of Airpower is Pre-
Eminence in Research”

Gen. H. H. Arnold, 1944